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# New Circumscription of the Endemic Brazilian Genus *Actinocephalus* (Eriocaulaceae)

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**ABSTRACT.** Based initially on the morphological similarity between species belonging to *Actinocephalus* (Körn.) Sano and *Paepalanthus* Mart. subsect. *Aphorocaulon* Ruhland (Eriocaulaceae), these taxa were studied to clarify their relationships. After intensive fieldwork and morphological analyses of specimens belonging to *Paepalanthus* subsect. *Aphorocaulon* and *Actinocephalus*, we conclude that *Paepalanthus* subsect. *Aphorocaulon* and *Actinocephalus* should not be classified as different taxa. This taxonomic opinion is confirmed by published phylogenetic morphological and molecular data. We propose herein to include species of *Paepalanthus* subsect. *Aphorocaulon* in *Actinocephalus*. Thus nomenclatural and taxonomic changes are proposed in *Actinocephalus* and *Paepalanthus* with the following 16 new combinations: *A. actinocephaloides* (Silveira) F. N. Costa [ $\equiv$  *P. actinocephaloides* Silveira], *A. arenicola* (Silveira) F. N. Costa [ $\equiv$  *P. arenicola* Silveira], *A. armeria* (Mart. ex Körn.) F. N. Costa [ $\equiv$  *P. armeria* Mart. ex Körn.], *A. bahiensis* (Bong.) F. N. Costa [ $\equiv$  *P. bahiensis* (Bong.) Kunth], *A. barbiger* (Silveira) F. N. Costa [ $\equiv$  *P. barbiger* Silveira], *A. geniculatus* (Bong.) F. N. Costa [ $\equiv$  *P. geniculatus* (Bong.) Kunth], *A. glareosus* (Bong.) F. N. Costa [ $\equiv$  *P. glareosus* (Bong.) Kunth], *A. heteropus* (Silveira) F. N. Costa [ $\equiv$  *P. heteropus* Silveira], *A. incanus* (Bong.) F. N. Costa [ $\equiv$  *P. incanus* (Bong.) Körn.], *A. longifolius* (Körn.) F. N. Costa [ $\equiv$  *P. longifolius* Körn.], *A. perbracchiatus* (Silveira) F. N. Costa [ $\equiv$  *P. perbracchiatus* Silveira], *A. phaeocephalus* (Ruhland) F. N. Costa [ $\equiv$  *P. phaeocephalus* Ruhland], *A. rhizomatosus* (Silveira) F. N. Costa [ $\equiv$  *P. rhizomatosus* Silveira], *A. scytophyllus* (Ruhland) F. N. Costa [ $\equiv$  *P. scytophyllus* Ruhland], *A. trichopeplus* (Silveira) F. N. Costa [ $\equiv$  *P. trichopeplus* Silveira], and *A. velutinus* (Silveira) F. N. Costa [ $\equiv$  *P. velutinus* Silveira]. In addition, nine new synonyms and lectotypifications for the six following names are presented: *Paepalanthus* subsect. *Aphorocaulon* Ruhland, *Paepalanthus* subsect. *Aphorocau-*

*lon*  $\beta$  *Incani* Ruhland [unranked], *Paepalanthus* subsect. *Aphorocaulon*  $\beta$  *Condensati* Ruhland [unranked], *P. incanus* (Bong.) Körn. var.  $\alpha$  Körn., *P. praemorsus* Ruhland, and *A. scytophyllus* (Ruhland) F. N. Costa. As newly circumscribed, the genus *Actinocephalus* comprises 49 species restricted to Brazil, with the Espinhaço Range as the center of species diversity. Species of *Actinocephalus* can be distinguished principally by the presence of paraclades covered by bracts and rarely a single scape arranged in an umbelliform corymbose inflorescence at the apex.

**RESUMO.** Baseado inicialmente na similaridade morfológica entre as espécies pertencentes à *Actinocephalus* (Körn.) Sano e *Paepalanthus* Mart. subsect. *Aphorocaulon* Ruhland, estes táxons foram estudados a fim de elucidar suas relações. Após intensivo trabalho de campo e estudo da morfologia das espécies pertencentes a *Paepalanthus* subsect. *Aphorocaulon* and *Actinocephalus*, concluímos que não é possível reconhecer *Paepalanthus* subsect. *Aphorocaulon* and *Actinocephalus* como dois táxons distintos. O posicionamento das espécies de *Paepalanthus* subsect. *Aphorocaulon* em *Actinocephalus* também foi confirmado em análises filogenéticas publicadas por outros pesquisadores, empregando dados morfológicos e moleculares. Portanto, propomos aqui a inclusão das espécies de *Paepalanthus* subsect. *Aphorocaulon* em *Actinocephalus*, assim como as mudanças nomenclaturais e taxonômicas em *Actinocephalus* e *Paepalanthus*, com dezesseis novas combinações: *A. actinocephaloides* (Silveira) F. N. Costa [ $\equiv$  *P. actinocephaloides* Silveira], *A. arenicola* (Silveira) F. N. Costa [ $\equiv$  *P. arenicola* Silveira], *A. armeria* (Mart. ex Körn.) F. N. Costa [ $\equiv$  *P. armeria* Mart. ex Körn.], *A. bahiensis* (Bong.) F. N. Costa [ $\equiv$  *P. bahiensis* (Bong.) Kunth], *A. barbiger* (Silveira) F. N. Costa [ $\equiv$  *P. barbiger* Silveira], *A. geniculatus* (Bong.) F. N. Costa [ $\equiv$  *P. geniculatus* (Bong.) Kunth], *A.*



*glareosus* (Bong.) F. N. Costa [= *P. glareosus* (Bong.) Kunth], *A. heteropus* (Silveira) F. N. Costa [= *P. heteropus* Silveira], *A. incanus* (Bong.) F. N. Costa [= *P. incanus* (Bong.) Körn.], *A. longifolius* (Körn.) F. N. Costa [= *P. longifolius* Körn.], *A. perbracchiatus* (Silveira) F. N. Costa [= *P. perbracchiatus* Silveira], *A. phaeocephalus* (Ruhland) F. N. Costa [= *P. phaeocephalus* Ruhland], *A. rhizomatosus* (Silveira) F. N. Costa [= *P. rhizomatosus* Silveira], *A. scytophyllus* (Ruhland) F. N. Costa [= *P. scytophyllus* Ruhland], *A. trichopeplus* (Silveira) F. N. Costa [= *P. trichopeplus* Silveira], and *A. velutinus* (Silveira) F. N. Costa [= *P. velutinus* Silveira]. Também são propostas nove novas sinonímias e lectotipificações para os seis nomes: *Paepalanthus* subsect. *Aphorocaulon* Ruhland, *Paepalanthus* subsect. *Aphorocaulon*  $\beta$  *Inceni* Ruhland [unranked], *Paepalanthus* subsect. *Aphorocaulon*  $\beta$  *Condensati* Ruhland [unranked], *P. incanus* (Bong.) Körn. var.  $\alpha$  Körn., *P. praemorsus* Ruhland e *A. scytophyllus* (Ruhland) F. N. Costa. Considerando esta nova circunscrição, o gênero *Actinocephalus* abrange 49 espécies restritas ao Brasil, com centro de diversidade localizado na Cadeia do Espinhaço. Os representantes deste gênero podem ser distinguidos principalmente pela presença de paracládios cobertos por brácteas e portando, no ápice, um único escapo ou então numerosos escapos em um arranjo umbeliforme.

**Key words:** *Actinocephalus*, Brazil, Eriocaulaceae, *Paepalanthus*.

Sano (2004) elevated a section within *Paepalanthus* Mart., section *Actinocephalus* (Körn.) Ruhland, to generic rank as *Actinocephalus* (Körn.) Sano. The genus is distinguished from other genera of Eriocaulaceae principally by cincinnate inflorescences with an umbellate arrangement of capitula. The subsequent taxonomic revision of *Paepalanthus* subsect. *Aphorocaulon* Ruhland (Costa, 2005) indicated that many of the species in this subsection also have an umbelliform arrangement of the capitula rather than a fasciculate form, although these cincinnate inflorescences were previously designated as “inflorescences in fascicle” by Ruhland (1903: 167). Species of *Paepalanthus* subsect. *Aphorocaulon* indeed share other characters with *Actinocephalus*, which include paraclades that are covered by foliage bracts, trimerous flowers, simple stigmas, and staminodes that are evident in the pistillate flowers. Taxonomic revision by Costa (2005) clearly supported the inclusion of species in *Paepalanthus* subsect. *Aphorocaulon* within the segregate genus *Actinocephalus* sensu Sano (2004). Recent phylogenetic studies of Eriocaulaceae based on morphological and molecular data (Giulietti et al., 2000; Unwin, 2004; Andrade et al., 2010) indicate

that *Actinocephalus* would be monophyletic if *Paepalanthus* subsect. *Aphorocaulon* were included. Therefore, based mainly on morphological studies, but also supported by molecular data, we transfer the species of this subsection to *Actinocephalus*. Also reported herein are associated and novel nomenclatural actions that result from the new circumscription of the genus *Actinocephalus*.

**I. *Actinocephalus* (Körn.) Sano, Taxon 53(1): 99. 2004.** *Paepalanthus* Mart. subg. *Actinocephalus* Körn., in Martius and Eichler, Fl. Bras. 3(1): 321. 1863. *Paepalanthus* sect. *Actinocephalus* (Körn) Ruhland in Engler, Pflanzenr. IV, 30 (Heft 13): 189. 1903. TYPE: *Actinocephalus polyanthus* (Bong.) Sano (lectotype, designated by Sano [2004: 99]).

*Paepalanthus* sect. *Actinocephalus*  $\beta$  *Ramosi* Ruhland [unranked], in Engler, Pflanzenr. IV, 30 (Heft 13): 189. 1903. TYPE: *Actinocephalus ramosus* (Wikstr.) Sano.

*Paepalanthus* sect. *Actinocephalus*  $\beta$  *Perbreves* Ruhland [unranked], in Engler, Pflanzenr. IV, 30 (Heft 13): 189. 1903. TYPE: *Actinocephalus rigidus* (Bong.) Sano (lectotype, designated by Sano [2004: 99]).

*Paepalanthus* subsect. *Aphorocaulon* Ruhland, in Engler, Pflanzenr. IV, 30 (Heft 13): 167. 1903. TYPE: *Actinocephalus geniculatus* (Bong.) F. N. Costa (lectotype, designated here).

*Paepalanthus* subsect. *Aphorocaulon*  $\beta$  *Inceni* Ruhland [unranked], in Engler, Pflanzenr. IV, 30 (Heft 13): 168. 1903. TYPE: *Actinocephalus incanus* (Bong.) F. N. Costa (lectotype, designated here).

*Paepalanthus* subsect. *Aphorocaulon*  $\beta$  *Condensati* Ruhland [unranked], in Engler, Pflanzenr. IV, 30 (Heft 13): 168. 1903. TYPE: *Actinocephalus glareosus* (Bong.) F. N. Costa (lectotype, designated here).

Plants perennial or monocarpic perennial; rhizomes present or not; stems short or elongate, densely lanate, internodes short with leaves in basal rosettes; rosettes persistent or deciduous. Leaves lanceolate or linear, adpressed to reflexed, light to dark green or grayish green, glabrous to densely pilose, margins flat to involute, ciliate to smooth, apices pointed to mucronulate, glabrous to densely barbellate. Elongated fertile axis present or absent, ramification present or not, arising from the apex of the basal rosette; axis of the synflorescence present or not, arising always from the apex of the rosette; paraclades axillary to the rosette leaves or arising from a central axis or lateral axis of the synflorescence, densely pilose in the region of insertion in the bracts; bracts occurring spirally along axis and paraclades, deciduous or persistent, foliaceous, lanceolate, their coloration, pilosity, margins, and apices similar to the rosette leaves; spathes membranous, glabrous to pilose, broad to narrow, apices oblique to truncate,



ciliate or glabrous; scapes persistent or deciduous, arising always from the apex of the paraclades, ranging from 1 to 800 per paraclade, arranged in an umbel, glabrous to densely pilose, trichomes simple or T-shaped; capitula persistent or deciduous, white, ochre, or sulfurous yellow in color; receptacles always pilose, trichomes equal to or longer than flowers; involucre bracts cream-colored to dark brown, in 2 to numerous series, oblong to broadly ovate, concave, both faces glabrous to pilose, margins glabrous to pilose, apices truncate to pointed, apiculate or not. Flowers diclinous, trimerous, 20 to 600 per capitulum, staminate and pistillate flowers positioned variably on the capitulum, trichomes of the perianth smooth or tuberculate, trichomes with internal ornamentation present or absent; floral bracts always present, obovate to linear, concave to navicular. Staminate flowers pedicellate, the pedicel glabrous to pilose, sepals briefly connate at the base, light brown to black, ciliate; sepal apices always pilose; corollas infundibular, urceolate or tubular, smooth, base of the corolla conspicuously carinose, lobes 3 to 6, hyaline, entire or bifid, involute only after anthesis; stamens 3, exerted, filaments cylindrical, adnate to the corolla tube only in the basal portion; anthers dorsifixed, bithecate; pistillodes 3, clavate to cylindrical, densely covered with papillose trichomes. Pistillate flowers sessile or pedicellate; sepals free, light brown to black, ciliate, sepal apices always pilose; petals free, hyaline, apices pilose or glabrous; staminodes squamiform in the region of the gynoecial septa; gynoecium 3-locular, styles and appendages always free at the same height on the column of the gynoecium; appendages pyriform or clavate, covered by short or long papillose trichomes; styles filiform, with the same length or longer than the appendages; stigmas always simple. Fruit a loculicidal capsule; seeds 1–2 mm, red-brown to dark brown, testa densely reticulate.

*List of included taxa.* (Forty-nine species; five varieties; asterisks indicate names transferred herein.) \**Actinocephalus actinocephaloides* (Silveira) F. N. Costa, *A. aggregatus* F. N. Costa, \**A. arenicola* (Silveira) F. N. Costa, \**A. armeria* (Mart. ex Körn.) F. N. Costa, \**A. bahiensis* (Bong.) F. N. Costa, \**A. barbiger* (Silveira) F. N. Costa, *A. bongardii* (A. St.-Hil.) Sano, *A. brachypus* (Bong.) Sano, *A. cabralensis* (Silveira) Sano, *A. callophyllus* (Silveira) Sano, *A. ciliatus* (Bong.) Sano, *A. cipoensis* (Silveira) Sano, *A. clausenianus* (Körn.) Sano, *A. compactus* (Gardner) Sano, *A. coutoensis* (Moldenke) Sano, *A. deflexus* F. N. Costa, *A. delicatus* Sano, *A. denudatus* (Körn.) Sano, *A. diffusus* (Silveira) Sano, *A. divaricatus* (Bong.) Sano, *A. falcifolius* (Körn.) Sano, *A. fimbriatus*

(Silveira) Sano, \**A. geniculatus* (Bong.) F. N. Costa, *A. giuliettiae* Sano, *A. glabrescens* (Silveira) Sano, \**A. glareosus* (Bong.) F. N. Costa, *A. graminifolius* F. N. Costa, *A. herzogii* (Moldenke) Sano, *A. herzogii* var. *herzogii*, *A. herzogii* var. *humilis* (Sano) Sano, \**A. heteropus* (Silveira) F. N. Costa, *A. heterotrichus* (Silveira) Sano, \**A. incanus* (Bong.) F. N. Costa, *A. ithyphyllus* (Mart.) Sano, *A. koernickeanus* Trovó & F. N. Costa, \**A. longifolius* (Körn.) F. N. Costa, *A. nodifer* (Silveira) Sano, *A. ochrocephalus* (Körn.) Sano, *A. pachyphyllus* (Körn.) F. N. Costa, Trovó & Echtern., \**A. perbracchiatus* (Silveira) F. N. Costa, \**A. phaeocephalus* (Ruhland) F. N. Costa, *A. polyanthus* (Bong.) Sano, *A. polyanthus* var. *bifrons* (Silveira) Sano, *A. polyanthus* var. *plumipes* (Silveira) Sano, *A. polyanthus* var. *polyanthus*, *A. ramosus* (Wikstr.) Sano, \**A. rhizomatosus* (Silveira) F. N. Costa, *A. rigidus* (Bong.) Sano, *A. robustus* (Silveira) Sano, \**A. scytophyllus* (Ruhland) F. N. Costa, *A. stereophyllus* (Ruhland) Sano, \**A. trichopeplus* (Silveira) F. N. Costa, \**A. velutinus* (Silveira) F. N. Costa, and *A. verae* Sano & Trovó.

*Discussion.* *Actinocephalus* species can be recognized principally by the presence of paraclades that are obscured by foliage bracts and numerous scapes for each paraclade in an umbellate corymbose inflorescence, with rarely a single scape. Flowers are trimerous, and stigmas are simple. With the new circumscription herein and seven species described recently (Costa, 2006; Trovó & Costa, 2009; Trovó & Sano, 2010; Echternacht et al., 2011), as well as one reestablishment and new combination (Trovó et al., 2012), the genus *Actinocephalus* now comprises 49 species restricted in geographic distribution to Brazil, occurring mainly in the Espinhaço Range of Minas Gerais and Bahia.

Ruhland (1903) proposed *Paepalanthus* subsect. *Aphorocaulon* and divided this subsection into two unranked subgroups, *Paepalanthus* [unranked] *Incani* and *P.* [unranked] *Condensati*. However, Ruhland (1903) did not designate the type species, and thus it is necessary to designate the lectotypes. These species here designated are the most commonly recognized and widespread of these taxa.

**1. *Actinocephalus actinocephaloides*** (Silveira) F. N. Costa, comb. nov. Basionym: *Paepalanthus actinocephaloides* Silveira, Floral. Mont. 1: 135, tab. 84. 1928. TYPE: Brazil. Minas Gerais: Diamantina, “in campis prope Diamantina,” Apr. 1918, A. Silveira 687 (holotype, R).

**2. *Actinocephalus arenicola*** (Silveira) F. N. Costa, comb. nov. Basionym: *Paepalanthus arenicola*



Silveira, *Floral. Mont.* 1: 144, tab. 90. 1928. TYPE: Brazil. Minas Gerais: Santana do Riacho, “in arenosis camporum prope Bandeirinhas, Serra do Cipó,” Apr. 1909, *A. Silveira* 552 (holotype, R).

*Paepalanthus gibbosus* Silveira, *Floral. Mont.* 1: 142, tab. 89. 1928, syn. nov. TYPE: Brazil. Minas Gerais: Gouveia, “in campis, prope Contagem in Serra do Riacho do Vento, inter Diamantina, et Curvello,” Apr. 1908, *A. Silveira* 505 (holotype, R).

**Discussion.** Silveira (1928) assumed that *Paepalanthus arenicola* and *P. gibbosus* shared similar roots, stems, leaves, and paraclades. He distinguished both species by differences related to the length of scapes and additional characters such as the capitula shape and the color of trichomes on the receptacle. Nevertheless, the specimens identified under either species name do not exhibit convincing characteristics to support their distinction as separate taxa. Both species were concomitantly described by Silveira (1928), and the epithet *arenicola* preferred here refers to the sandy soil in which the species is found. This decision is supported by Article 11.5 of the Code (McNeill et al., 2006).

**3. *Actinocephalus armeria*** (Mart. ex Körn.) F. N. Costa, comb. nov. Basionym: *Paepalanthus armeria* Mart. ex Körn., in Martius & Eichler, *Fl. Bras.* 3(1): 377. 1863. *Dupatya armeria* (Mart. ex Körn.) Kuntze, *Revis. Gen. Pl.* 2: 745. 1891. TYPE: Brazil. Goiás: “Crescit in prov. Goyazensis Chapada de S. Marcos,” s.d., *J. B. E. Pohl* s.n. (holotype, M).

**Discussion.** Koernicke (1863: 377) validly published the name *Paepalanthus armeria* in *Flora Brasiliensis*, attributing the first use of the name to Martius in sched., but this was never published. Koernicke did note a collection of this species (*Pohl* s.n.) in the 1863 protologue, and there is a collection of this species deposited at M. We studied this collection here and identify it as the holotype of *P. armeria*.

**4. *Actinocephalus bahiensis*** (Bong.) F. N. Costa, comb. nov. Basionym: *Eriocaulon bahiense* Bong., *Mém. Acad. Imp. Sci. St.-Pétersbourg*, Sér. 6, *Sci. Math.* 1: 622. 1831. *Paepalanthus bahiensis* (Bong.) Kunth, *Enum. Pl.* 3: 517. 1841. *Dupatya bahiensis* (Bong.) Kuntze, *Revis. Gen. Pl.* 2: 745. 1891. TYPE: Brazil. Bahia: “Habitat prope Rio dos Contos, provinciae Bahiensis,” Feb. 1821, *L. Riedel* s.n. (holotype, LE [barcode] 00001043 not seen, LE [barcode] 00001043 digital image).

*Paepalanthus variabilis* Silveira, *Fl. Serr. Min.* 49, tab. 17. 1908, syn. nov. TYPE: Brazil. Minas Gerais: “In campis, loccis siccis arenosisque, in Serra do Cipó,” Apr. 1905, *A. Silveira* 313 (holotype, R; isotype, B [barcode] 10 0247629).

*Paepalanthus variabilis* var. *glabrescens* Silveira, in Silveira, *Floral. Mont.* 1: 156, tabs. 97–98. 1928, syn. nov. TYPE: Brazil. Minas Gerais: “In campis arenosis in Serra do Cabral,” Nov. 1918, *A. Silveira* 645 (holotype, R).

*Paepalanthus conicus* Silveira, *Floral. Mont.* 1: 136, tab. 85. 1928, syn. nov. TYPE: Brazil. Minas Gerais: “In campis prope Milho Verde, in Serra do Espinhaço,” June 1925, *A. Silveira* 759 (holotype, R).

*Paepalanthus polyandrus* Silveira, *Floral. Mont.* 1: 140, tab. 88. 1928, syn. nov. TYPE: Brazil. Minas Gerais: “In campis arenosis in Serra do Cabral,” Nov. 1918, *A. Silveira* 646 (holotype, R).

**Discussion.** Although the type of *Actinocephalus bahiensis* was noted in the protologue (Bongard, 1831) as collected in Bahia, its current distribution appears to be restricted to Minas Gerais. Possibly the label of the sheet was changed, or the species had a wider geographic distribution in the past, but in fact it is not possible to confirm this distribution.

This species presents great morphological variability, and because of this, many new taxa were formerly described. However, these represent the extreme of this variability, mainly in relation to the size and indument, and new synonyms for two species and two varieties are herein proposed.

**5. *Actinocephalus barbiger*** (Silveira) F. N. Costa, comb. nov. Basionym: *Paepalanthus barbiger* Silveira, *Fl. Serr. Min.* 47, tab. 16. 1908. TYPE: Brazil. Minas Gerais: “in campis arenosis siccisque prope Morro do Breu, in Serra do Cipó,” Apr. 1905, *A. Silveira* 352 (holotype, R; isotypes, B [barcode] 10 0247853, OUPR).

**6. *Actinocephalus geniculatus*** (Bong.) F. N. Costa, comb. nov. Basionym: *Eriocaulon geniculatum* Bong., *Mém. Acad. Imp. Sci. St.-Pétersbourg*, Sér. 6, *Sci. Math.* 1: 625. Fig. 31. 1831. *Paepalanthus geniculatus* (Bong.) Kunth, *Enum. Pl.* 3: 521. 1841. *Dupatya geniculata* (Bong.) Kuntze, *Revis. Gen. Pl.* 2: 745. 1891. TYPE: Brazil. Minas Gerais: “Habitat in glareosis subhumidis Serra da Lapa,” Dec. 1824, *L. Riedel* 1064 (holotype, LE [barcode] 00002826 digital image; isotypes, B [barcode] 10 0247780, G [barcode] 00098971, K [barcode] 000640028, P [barcode] 00670062).

*Paepalanthus myriophyllus* Silveira, *Floral. Mont.* 1: 147, tab. 92. 1928, syn. nov. TYPE: Brazil. Minas Gerais: “In campis inter Serro et Datas, in Serra do Geral,” June 1925, *A. Silveira* 760 (holotype, R).



**Discussion.** Silveira (1928) placed his new species *Paepalanthus myriophyllus* in *Paepalanthus* subsect. *Aphorocaulon*. However, the holotype of *P. myriophyllus* corresponds to *Actinocephalus geniculatus*, based on common features such as the linear leaves and short paraclades (0.8–3.5 cm) with few scapes (one to three).

**7. *Actinocephalus glareosus* (Bong.) F. N. Costa,** comb. nov. Basionym: *Eriocaulon glareosum* Bong., Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 1: 625, tab. 25. 1831. *Paepalanthus glareosus* (Bong.) Kunth, Enum. Pl. 3: 521. 1841. *Dupatya glareosa* (Bong.) Kuntze, Revis. Gen. Pl. 2: 745. 1891. TYPE: Brazil. Minas Gerais: “In glareosis locis Serra da Lapa,” Nov. 1824, *L. Riedel* 1043 (holotype, LE [barcode] 00001170, isotypes, B [barcode] 10 0247778, G [barcode] 00099138, K [barcode] 000640029, P [barcode] 01762678).

**8. *Actinocephalus heteropus* (Silveira) F. N. Costa,** comb. nov. Basionym: *Paepalanthus heteropus* Silveira, Floral. Mont. 1: 139, tab. 87. 1928. TYPE: Brazil. Minas Gerais: “In campis arenosis prope Itambé do Serro,” Apr. 1918, *A. Silveira* 686 (holotype, R).

**9. *Actinocephalus incanus* (Bong.) F. N. Costa,** comb. nov. Basionym: *Eriocaulon incanum* Bong., Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 1: 623, tab. 61. 1831. *Paepalanthus incanus* (Bong.) Körn. var.  $\beta$  Körn., in Martius & Eichler, Fl. Bras. 3(1): 380. 1863. *Dupatya incana* (Bong.) Kuntze, Revis. Gen. Pl. 2: 746. 1891. TYPE: Brazil. Minas Gerais: “In arenosis prope Tejuco [Diamantina],” Dec. 1824, *L. Riedel* s.n. (holotype, LE [barcode] 00001080).

*Paepalanthus incanus* (Bong.) Körn. var.  $\alpha$  Körn., in Martius & Eichler, Fl. Bras. 3(1): 380. 1863, syn. nov. TYPE: Brazil. “in Brasilia orientali; Princ. Neovid.; et in prov. Minarum [Minas Gerais] altis frigidiusculis districtus Serro Frio: M.” s.d., *Pohl* s.n. (lectotype, designated here, M).

*Paepalanthus hemiglobosus* Silveira, Floral. Mont. 1: 181, tab. 117. 1928, syn. nov. TYPE: Brazil. Minas Gerais: “In campis arenosis inter Serro et Datas,” June 1925, *A. Silveira* 783 (holotype, R).

**Discussion.** Koernicke (1863: 380) cited and described two varieties for *Paepalanthus incanus*, “var.  $\alpha$ : caule perbreve,” with a very short stem, and “var.  $\beta$ : caule elongate,” with a long stem. The second variety ( $\beta$ ) corresponds to the type for *Eriocaulon incanus*, cited by Bongard (1831: 623)

as “habitat in arenosis prope Tejuco.” However, for *P. incanus* var.  $\alpha$ , Koernicke referred to localities and not to any particular collection, noting variety  $\alpha$  “in Brasilia orientali; Princ. Neovid.; et in prov. Minarum altis frigidiusculis districtus Serro Frio: M.” Only the letter “M” was cited, perhaps in reference to the herbarium M or to a collection seen by Martius. Within the collections at the Munich herbarium, we identified one sheet of *P. incanus* collected by Pohl without number or date yet with comments in Koernicke’s handwriting, which we interpret and designate as the lectotype for variety  $\alpha$ . There are also numerous sheets of *Actinocephalus incanus* [ $\equiv$  *P. incanus*] at Munich, but they are annotated with the unpublished name *P. frigidulus* used by Martius.

Later, Ruhland (1903) cited several sheets for the species *Paepalanthus incanus*, among them two specimens collected by Riedel, one being *L. Riedel* s.n. (holotype, LE [barcode] 00001080) from Tejuco, currently known as the Diamantina Municipality of Minas Gerais, and the other one being *L. Riedel* s.n. (herbarium of deposit not stated) from “bei Ilheos und Camamu” in Bahia. However, *Actinocephalus incanus* is restricted to Minas Gerais, and the material collected in “Ilheos und Camamu” in Bahia has not been found as deposited at any of the herbaria visited by the authors. Species of *Actinocephalus* and other related genera do occur in the mountains of Espinhaço Range and on sand dunes of the Atlantic littoral zone, but *P. incanus* does not occur there.

*Paepalanthus hemiglobosus* was described by Silveira in *Paepalanthus* subsect. *Actinocephaloideis* Ruhland, but the type is morphologically identical to *Actinocephalus incanus*, sharing a tomentose spathe, cream-colored involucral bracts, and ramification characteristic of the plants.

**10. *Actinocephalus longifolius* (Körn.) F. N. Costa,** comb. nov. Basionym: *Paepalanthus longifolius* Körn., in Martius & Eichler, Fl. Bras. 3(1): 333. 1863. *Dupatya longifolia* (Körn.) Kuntze, Revis. Gen. Pl. 2: 746. 1891. TYPE: Brazil. Minas Gerais: “Crescit in Brasilia centrali,” s.d., *L. Riedel* s.n. (holotype, LE).

*Paepalanthus applanatus* Ruhland, in Engler, Pflanzenr. IV, 30 (Heft 13): 169. 1903, syn. nov. TYPE: Brazil. Minas Gerais: “Serra do Cipó, dans le campo, près Congonhas,” 24 Apr. 1892, *A. F. M. Glaziou* 19973 (holotype, B [barcode] 10 0157347, isotypes, MO-1664485, P).

**Discussion.** *Paepalanthus applanatus* was described by Ruhland (1903) in *Paepalanthus* subsect. *Aphorocaulon*, and the type belongs to *Actinocephalus*



*longifolius*, based on common features such as the presence of an elongated fertile axis and scapes with trichomes that are T-shaped.

**11. *Actinocephalus perbracchiatus*** (Silveira) F. N. Costa, comb. nov. Basionym: *Paepalanthus perbracchiatus* Silveira, Floral. Mont. 1: 137, tab. 86. 1928. TYPE: Brazil. Minas Gerais: "In campis arenosis inter Serro et Datas, in Serra do Espinhaço," June 1925, A. Silveira 757 (holotype, R).

**12. *Actinocephalus phaeocephalus*** (Ruhland) F. N. Costa, comb. nov. Basionym: *Paepalanthus phaeocephalus* Ruhland, in Engler, Pflanzenr. IV, 30 (Heft 13): 169. 1903. TYPE: Brazil. Goiás: "Cabeceira do Rio Sant'Anna, dans le bois," 8 Jan. 1895, A. F. M. Glaziou 22314 (holotype, R; isotypes, G [barcode] 00099079, K [barcode] 000640030, P [barcode] 00741971).

**13. *Actinocephalus rhizomatosus*** (Silveira) F. N. Costa, comb. nov. Basionym: *Paepalanthus rhizomatosus* Silveira, Floral. Mont. 1: 148, tab. 93. 1928. TYPE: Brazil. Minas Gerais: "In campis prope Baraunas, in Serra Geral," June 1925, A. Silveira 761 (holotype, R).

**14. *Actinocephalus scytophyllus*** (Ruhland) F. N. Costa, comb. nov. Basionym: *Paepalanthus scytophyllus* Ruhland, in Engler, Pflanzenr. IV, 30 (Heft 13): 171. 1903. TYPE: Brazil. Minas Gerais: "Tombador près Diamantina, dans le campo," 4 Apr. 1892, A. F. M. Glaziou 19967 (lectotype, designated here, B [barcode] 10 0157349; isoelectotypes, K, MO-1664562, P [barcode] 00741986).

*Discussion.* Ruhland (1903: 171) cited two collections from Minas Gerais when he described *Paepalanthus scytophyllus*. The first collection was Glaziou n. 19971 from "Pinheiro, auf trockenen Campos"; the second, "*Derselbe* [Glaziou] n. 19967," was noted as being from "Tombador bei Diamantina, auf Campos." It is necessary to designate the lectotype between these two syntypes, with the collection Glaziou n. 19967 chosen because it is more representative of the taxon than Glaziou n. 19971.

**15. *Actinocephalus trichopeplus*** (Silveira) F. N. Costa, comb. nov. Basionym: *Paepalanthus trichopeplus* Silveira, Fl. Serr. Min. 46. 1908. TYPE: Brazil. Minas Gerais: Serra do Cipó, Apr. 1905, A. Silveira 353 (holotype, R; isotype, B [barcode] 10 0247641).

**16. *Actinocephalus velutinus*** (Silveira) F. N. Costa, comb. nov. Basionym: *Paepalanthus velutinus* Silveira, Floral. Mont. 1: 145, tab. 91. 1928. TYPE: Brazil. Minas Gerais: "In campis arenosis in Serra do Cabral," May 1910, A. Silveira 577 (holotype, R).

#### EXCLUDED TAXA FROM *ACTINOCEPHALUS*

1. *Paepalanthus microphorus* Silveira, Floral. Mont. 1: 149, tab. 94. 1928. TYPE: Brazil. Minas Gerais: "In campis prope Milho Verde, in Serra Geral," June 1925, A. Silveira 762 (holotype, R).

*Discussion.* *Paepalanthus microphorus* does not have paraclades, and the flowers are dimerous, in marked contrast to the trimerous flowers and paraclades in *Actinocephalus*. The species is best placed in *Paepalanthus* ser. *Dimeri* (Ruhland) Giul.

*Paepalanthus macrocephalus* (Bong.) Körn., *P. praemorsus* Ruhland, and *P. scholiophyllus* Ruhland were included by Ruhland (1903) in *Paepalanthus* subsect. *Aphorocaulon*, but these species are morphologically distinct from *Actinocephalus* mainly by the absence of paraclades and a bifid stigma (vs. simple stigma in *Actinocephalus*) in *P. praemorsus*. These three species are best placed in *Paepalanthus* ser. *Variabiles* Ruhland.

2. *Paepalanthus macrocephalus* (Bong.) Körn., in Martius & Eichler, Fl. Bras. 3(1): 379. 1863. Basionym: *Eriocaulon macrocephalum* Bong., Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 1: 630, tab. 33. 1831. *Dupatya macrocephala* (Bong.) Kuntze, Revis. Gen. Pl. 2: 746. 1891. TYPE: Brazil. Minas Gerais: "In pratis humidis Serra da Lapa," Nov. 1824, L. Riedel 1036 (holotype, LE [barcode] 00001127, isotypes, B [barcode] 10 0243932, G [barcode] 00099097, K [barcode] 000640027, P).

3. *Paepalanthus praemorsus* Ruhland, in Engler, Pflanzenr. IV, 30 (Heft 13): 172. 1903. TYPE: Brazil. Minas Gerais: "Tombador, près Diamantina," 8 Apr. 1892, A. F. M. Glaziou 19960 (lectotype, designated here, B [barcode] 10 0157351; isoelectotypes, K, P [barcode] 00741973, 75, 76 [3]).

*Discussion.* Ruhland (1903: 172) cited two collections from Minas Gerais when he described *Paepalanthus praemorsus*. The first collection was Glaziou n. 19960 from "Tombador, bei Diamantina"; the second Glaziou collection, "*Derselbe* [Glaziou] n. 19966," was noted as being from "Serra dos Cristaes, bei Diamantina." It is necessary to designate the



lectotype between these two syntypes, and the collection *Glaziou n. 19960* is chosen because it is more representative of the taxon than *Glaziou n. 19966*.

4. *Paepalanthus scholiophyllus* Ruhland, in Engler, Pflanzenr. IV, 30 (Heft 13): 172. 1903. TYPE: Brazil. Goiás: “Capelinha de Santo Antonio dans le campo,” 23 Oct. 1894, A. F. M. Glaziou 22315 (holotype, B [barcode] 10 0157342; isotypes, G [barcode] 00099073, K [barcode] 00099073, P [barcode] 00741982).

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